USING SOCIAL MEDIA TO MEASURE DETERRENCE

GRADUATE RESEARCH PAPER

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Abstract

This research paper looks at the global requirement of the Bomber Assurance and Deterrence (BAAD) mission and proposes both a framework and a method to aid in measuring the effectiveness of this mission. It takes into account the potential of utilizing social media analytics and applying it to the BAAD mission. Given the rapid growth of social media, people are able to—more than ever before—express themselves concerning their views, opinions, and emotions on several different forums, blogs, and social networking sites. With the amount of social network sites (SNS) available, it provides an effective medium for individuals to communicate, while also providing a means to capture sentiment, effectiveness, and how an organization affects people around the world.

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I. Introduction

Background

As discussed in the 2014 Quadrennial Defense Review, there is a requirement to adapt, reshape, and rebalance our military to address the dynamic world we operate in. In order to achieve such change, three avenues must be prioritized: defending the homeland; building security globally by projecting United States influence and deterring aggression; and remaining prepared to win decisively against any adversary should deterrence fail (DoD, 2014). While also trying to maintain an effective fighting force, the United States must also make crucial choices in a constrained fiscal environment. Therefore, to ensure our resources are being utilized effectively this research will look at how best to measure our effectiveness while we are building security globally. More specifically, it will focus on a proposed method and framework aimed at measuring the effectiveness of the bomber assurance and deterrence (BAAD) missions conducted worldwide. While trying to understand what the effects of these missions have on our allies and adversaries, we could in theory modify or adjust how and when these missions are conducted based on those effects, while ensuring an efficient use of forces.

Another aspect to building global security is the approach to deterrence and assurance taken by the United States. An important factor in this is the dynamic threat environment in which we have to operate. Therefore, the need for assurance and deterrence is going to hinge upon the character of the forces supporting this objective while being responsive not only to the threat environment, but also the perceptions of our allies as well

(Payne and Foster, 2014). As a result, knowledge of the environment must be evaluated to help feed strategy, force type, and posture. One such area where the U.S. can gain information is by utilizing a particular method, in this research the method being proposed is social media analytics. Additionally, it will be proposing a framework to aid in this analysis. With the amount of social network sites (SNS) available, it provides a great medium for individuals to communicate, while also providing a means to capture sentiment, effectiveness, and how an organization is affecting people around the world. Social media analytics is primarily concerned with developing and evaluating tools and frameworks to help monitor, analyze, and visualize data collected from social media (Fan and Gordon, 2014). The ultimate end state is to take this data and extract useful patterns for the user, while also gaining information on the topic of interest. With the number of users growing rapidly on social media sites, so does the requirement for organizations to analyze the data from these sites and to help understand what the organizational effect is on the user.

One example where social media analytics could be applied was on 21 September 2016, when a pair of B-1 bombers flew from Guam to South Korea in a show of force in response to the nuclear test conducted by North Korea on 9 September 2016 (Tong-Hyung, 2016). How do we measure the effectiveness of this mission? Are the official statements and military posturing of North Korea the best indicators we have to measure our effectiveness? The proposed research here will aim to better understand how to measure the impacts of the BAAD mission with the aid of social media analytics.

Problem Statement

Security issues are a major concern, especially when considering the role of the United States when providing extended nuclear deterrence to several countries around the world. This is taken to another level when the United States is less interested in forward-deployed nuclear weapons, which can suggest a lessening of interest in extended nuclear assurance (Lyon, 2013). Therefore, the effectiveness of the BAAD mission needs to be precise due to the bomber leg of the nuclear triad having the greatest ability to visually project power all over the world. To help aid in this measurement most social media channels offer some form of insight, which can monitor performance and trends. The access and ability to capture data is the first step in this process, but there also lies the issue of having to filter out bad or "noisy" data, understanding the relevant data, and then presenting or visualizing the data for others to understand (King, 2015). Social media data is one of the largest, richest and highly dynamic sources of information for human behavior, which provides us with a plethora of data to help understand the impacts on an individual up to the society level (Batrinca and Treleaven, 2014).

Purpose Statement

The purpose of this research is to propose a method and framework to aid in determining the effects of the BAAD mission against our allies and adversaries. By capitalizing on the benefits of social media analytics the intent is to better understand how effectively these missions are providing both assurance and deterrence. Furthermore, this research is attempting to fill a gap in a complex process of measuring effectiveness and does not intend to be able to fully measure effectiveness with its findings alone.

Research Questions

The focus of this research is to propose a method and framework in order to help measure the effectiveness of BAAD missions. As a result, the following research questions have been developed in conjunction with the supporting investigative questions:

RQ) What is an efficient means to measure the effectiveness of the bomber assurance and deterrence mission?

IQ) What is an effective approach at implementing social media analytics?

IQ) Can we determine how effective the BAAD mission is from social media sites, official government statements, news outlets, etc.?

Scope

The focus of this research will be bounded to the means in which to best evaluate and monitor the effects of BAAD missions against our allies and adversaries. It will look at suggesting a method and framework to apply against social media to try and determine the most efficient method to track the effectiveness of these missions when considering the perception of our adversaries and allies. This research will not cover what the bomber force structure should consist of. Nor will it consider the difference between platforms or capabilities of those platforms conducting the BAAD missions. Finally, it will not be interested in assessing the impacts of change in the United States' nuclear posture. The point of interest is an application of a potential method and framework on how to efficiently measure our effectiveness during the execution of the BAAD mission.

Assumptions and Limitations

The researcher is limited by time and the inability to travel to geographic locations. Time will limit the amount of research, and the incapability to travel will limit the perspective from individual agencies within and outside of the Department of Defense (DoD). There may be additional ideas generated from this research in which this research will not fully capture. The lack of research in the literature concerning the BAAD mission will also limit the lens in which this research can cover. There is also the possibility that the suggestions and ideas generated from the data collection will not be universally accepted; consequently, the results may not be utilized by agencies within or outside of the DoD.

Summary

The global dynamic we now operate in is much different compared to the time of the Cold War. Several nations are modernizing both their conventional and nuclear capabilities. Furthermore, with countries such as Russia, China, and North Korea increasing their military actions it is crucial now, more than ever, to ensure the assurance and deterrence provided by the United States is performing effectively and efficiently (Bracken, 2013). Consequently, this research will help to understand the means in which we measure our effectiveness and how best to move forward while utilizing analytics against social media.

II. Methodology

Overview

This research utilized a qualitative methods approach in order to properly explore a problem for which no research is available. The ability to use this method is beneficial due to the need of understanding a problem which involves emerging questions. Due to both the lack of research on this topic as well as the emerging questions a particular theme was extracted and an ultimate interpretation of the data was completed. Thusly, the findings from this research are able to help fill in a gap within the literature.

Qualitative Approach

As discussed by Leedy and Ormrod, if there is little information which exists concerning a particular topic and a relevant theory base is missing, the qualitative study can afford a means in helping to define the problem. Another important aspect to the qualitative approach is the role in which the researcher plays into the research itself. For instance, qualitative researchers can gather data by observations and by examining documents. Furthermore, the researcher also does not always rely upon questionnaires developed by other researchers. The qualitative approach is also beneficial from an aspect of reflexivity. It is valuable to draw upon the personal background, cultural exposures, and experiences within not only the Air Force, but also capitalizing upon experiences in conducting several BAAD missions firsthand (Creswell, 2013). This allows the researcher to help advance the research overall by being able to compile the data into a meaningful and relevant framework. It ultimately provided for a more complete and holistic viewpoint in concluding the research. Coupled with that knowledge and the fact

this research is attempting to provide a method to evaluate the effectiveness of BAAD missions, this relationship affords a means to tackle that problem appropriately.

To help frame this research even further the use of content analysis was implemented. Content analysis helps with taking a particular body of material and attempting to pull out patterns, themes, or biases (Leedy and Ormrod, 2016). This is mainly accomplished by utilizing the different forms of human communication such as: documents, television, journals, and the internet to name only a few. It is mainly a technique to gather data on a particular individual, program, or event to aid in the understanding of a poorly understood situation. As is to be demonstrated in the literature review this connection is made by examining the communication channels within the social media sites along with measurements within social media analysis to help determine the patterns and sentiments being formed. This study will take into consideration not only historical data, but current events throughout the world to support the research. My experience as a bomber pilot within Air Force Global Strike Command and also conducting BAAD missions first hand also aided in guiding this research. The intent in utilizing this design is to help understand the past and future effectiveness of the BAAD missions. Data should not only be gathered after the execution of a BAAD mission, but also prior to and during the mission as well.

In order to define this research properly the quality in this qualitative research is being defined as one containing consistency and confirmability. As the literature review will illustrate there is consistency within the data reviewed to highlight patterns in the usefulness of utilizing social media analytics to determine the sentiment based on events occurring. The consistency of patterns through examination of the raw data provides

reliability in the data and therefore provides reliability and confirmability to the research (Golafsani, 2003). Furthermore, the researcher developed validity in this research is based upon trustworthiness and quality. It is a matter of providing confidence in the research presented to ensure the applicability and relevance not only against data within the literature review, but also the results and findings provided in the results and analysis section. It is important that the validity of this research engages others in a matter which excites further research resulting in a deeper understanding.

III. Literature Review

Overview

This review steps through the global requirement set forth by the United States to establish assurance and deterrence where needed. It helps to illustrate the significance of this mission within the inherent uncertainties we are facing regarding our adversaries around the world. It also points out the importance of reassuring our allies with the historical and current need for United States nuclear and conventional forces in Europe and Asia (Yost, 2009). The importance of this mission will be aided by a look at the literature from an analytical perspective and how it can play a role in providing a measurement to how effective the Air Force is when conducting the BAAD mission. Businesses are using social media analytics to help improve their reputations and overall performance. For instance, with social media growing enormously over the past decade with an estimated 1.59 billion active users on Facebook in 2016 alone, it is important to use this avenue for an organizations benefit (Chaffey, 2016). With the rise of "big data" on sites such as Facebook, Twitter, and Youtube it has provided a new means to study events across the globe. Therefore, this research will consider different application program interfaces (APIs) to utilize capturing, understanding, and presenting data in measuring the overall impact. Big data is described as large volumes of high velocity, complex, and variable data that requires advanced techniques and technologies in order to analysis appropriately (Gandomi and Haider, 2015). It will also take into consideration the challenges faced when looking for comprehensive access to the "raw" data (Batrinca and Treleaven, 2015). For instance, Facebook is making it

much more difficult to gain access and news services are charging a premium for access to their data. The literature review will then conclude with how organizational performance measures are utilized to help better grasp an understanding of effectiveness by both assessing and measuring it.

Global Requirement.

The research thus far suggests there is an ever more increasing requirement for the United States to ensure its allies and adversaries are assured and deterred, respectively. This is evident with North Korea in that Washington believes Pyongyang can be deterred by measures of prompt conventional strike and nuclear options as well (Lyon, 2013). Additionally, other countries such as Russia are boasting a foreign policy which is increasingly anti-American (Payne and Foster, 2015). Also concerning is the fact that Russia utilizes a nuclear policy which contains the option of employing nuclear weapons during a conventional war. The rules at the bargaining table changed on August 6th 1945, when the United States dropped Fat Man on Hiroshima, thus changing how we as a collective approach war. What changed was the concept of how quickly a nuclear armed country can take any situation and escalate it to extraordinary levels never imagined before (Schelling, 1966). Now countries do not need large conventional forces, but only a few nuclear weapons to be respected in regards to the effects they can induce upon the battlefield. Nuclear weapons now afford the ability to take the bargaining table and throw it out the window. The possibility is therefore present when a nuclear capable country can solely rely upon the awesome power of a nuclear weapon. Overall, several countries are upgrading and modernizing their

conventional and nuclear capabilities, which is requiring support from the United States to its allies while utilizing coverage under the nuclear umbrella.

Deterring Adversaries and Assuring Allies.

Allies in Europe and Asia completely rely upon the United States for its assurance and deterrence capabilities, especially from a nuclear standpoint. For instance as is stated in the 2014 Quadrennial Defense Review, "U.S. forces work closely with the nations of Europe on a wide range of shared goals, including strengthening NATO military capability and interoperability" (DoD, 2014: 18). Our allies lean on the capability of the United States to exercise assurance and deterrence missions. This was demonstrated in 2013 when two B-2 stealth bombers flew from Whitman AFB to South Korea, dropped inert weapons at a range, and returned to the U.S. (Solomon, 2013). This is a clear demonstration of the reliance of these types of missions by the South Korean government to help deter North Korea, being the South does not possess a nuclear capability. Deterrence is about intentions—about preventing someone, a nuclear equipped nation in this case, from acting in a particular manner (Schelling, 1966). As discussed by Herman Kahn, deterrence means to dissuade someone by terror, of which the motivation to refrain from acting is due to a fearful threat or a warning of fearful consequences. One major difference between the Cold War and the current global environment is we are no longer concerned with nuclear war between just the United States and the Soviet Union. We are now confronted with a dynamic of multiple players where nuclear weapons are fundamentally a part of foreign policy and decision making. The problem we face now is how are we going to manage the understanding of

relationships, instabilities, credibility, and the dangers associated with them (Bracken, 2013). If the United States does not respond in some form of a nuclear attack, do the allies of the United States, which fall under the nuclear umbrella, maintain their reliance upon the U.S. to protect their country? If they do not, then we stand a real chance of those allies becoming interested in gaining nuclear technology and weaponry in order to protect themselves. This would then be in direct conflict to the intention of the nuclear nonproliferation treaty and be a step in the wrong direction. As was mentioned in the previous section Thomas Schelling discusses deterrence as being about intentions. He states that, "…not just estimating enemy intentions but influencing them. The hardest part is communicating our own intentions" (Schelling, 1966). An opponent needs to believe the will of the United States, while understanding its commitment. A commitment to defending not only the United States itself, but also the commitment of going to great lengths to defend allies of the United States as well. Therefore, it is critical the United States is utilizing its forces effectively when conducting missions. With the limited time spans and limited resources the U.S. must measure its performance when conducting such missions as the BAAD mission to ensure not only that forces are being utilized correctly, but that our adversaries and our allies are receiving the intended message. Thus, using social media as an avenue in measuring effectiveness can have great potential due to its ever increasing popularity and far reaching capability over all regions of the world.

Social Media Analytics.

The research thus far concludes there are some measures of effectiveness generated by the bomber and assurance missions, but further analysis is needed. There are reactions such as official government statements, military escalation, and media coverage, but how do we fully understand the proper way to measure the effectiveness of these missions? For instance, in April of 2016 two Russian fighter jets flew within 30 feet of the USS Donald Cook (Browne, 2016). Are we to assume this single reaction is enough to understand the impact of our BAAD missions when considering the Russians and our allies in the region? Or do we need to take a closer look at news feeds and social media coverage? These measures may not only come from within one source of social media, but perhaps we need to take into consideration several sources of social media sites when trying to determine the true impact of a particular event, in this case the execution of a BAAD mission. Given the rapid growth of social media, people are able to—more than ever before—express themselves concerning their views, opinions, and emotions on several different forums, blogs, and social networking sites (SNS) (Stieglitz and Dang-Xuan, 2012). Analyzing social media is now a major research and business activity based on this growth with the availability also of web-based application programming interfaces (APIs) provided by such social networking sites as Twitter, Facebook, and news services (e.g., Thomson Reuters Machine Readable News) for data tracking. For instance, both Twitter and Facebook offer APIs for data tracking. The most used APIs for Twitter are “Search API” and “Streaming API”, while Facebook offers the “Graph API” which allows programmers to conveniently track Wall postings. As a result there is much interest in computational statistics and machine learning along with

big data complementing data mining techniques. Machine learning is where a system is capable of the autonomous acquisition and integration of knowledge learned from experience and analytical observation (Batrinca and Treleaven, 2014). Businesses have noticed this change and have made a valiant effort toward leveraging the power of social media in order to help their organization succeed (Mosley, 2012).

Opinions and perceptions are important when making decisions. The need for opinions, perceptions, and sentiments can aid greatly in making a decision on a personal level, but also on an organizational level as well. Sentiment analysis—or opinion mining—have aided in this area by examining people's opinions in terms of views, emotions, events, which lends to people's opinions toward products, organizations, individuals, and events (Gandomi and Haider, 2015). In the area of marketing, finance, and social sciences, sentiment analysis has become a major technique in these areas. The understanding of people's sentiment is really about the community rather than a single person. There will obviously be more active participants compared to others, but overall social media analysis in this regard is able to bring a sense of what this community is feeling (Mosley, 2012). An example of community can be seen within Facebook, which can be partially geographically bounded (Golder et al., 2007). It depends upon which network a person is associated with and profiles are visible only to those in that network or if they are friends within Facebook. Within these social networking sites the content contains textual disorder and diversity. Sentiment analysis will be able to provide the attitude or opinion of a person in an overall context while examining a document. As will be discussed later, there are challenges with attempting to understands a person's opinion based solely on information extracted from a sentence and then analyzed to see

how that person is truly reacting to the event in question.

Additionally, with so much “big-data” available it is nearly a requirement to approach this task from an automated perspective versus a manual perspective. With several hundred social networking sites alone it is impossible to capture all of the relevant data to completely understand the true impact of the event (Huberman et al., 2009). Therefore, automated systems are needed to sift through the data and that is where sentiment analysis is needed. One of the two approaches in sentiment analysis is to simply extract words annotated as either having a positive, negative, or neutral connotation. The second approach relies upon either a supervised or unsupervised method of sentiment classification. Under the supervised method it would mostly utilize a naïve Bayesian or support vector machine (SVM) classification. More specifically it would use statistical algorithms from machine learning to generate some supervised text classification. The unsupervised learning method uses a natural language processing (NLP) technique called part-of-speech (POS) tagging (Stieglitz and Dang-Xuan, 2012). This is done by marking a word in a segment of text, as corresponding to a part of speech, based on both its definition and context. That is to say its relationship to adjacent words in either a phrase, sentence, or paragraph is examined appropriately. With this in mind it is important to remember that using a single data set can provide some interesting results, but by combining more data sets and processing the unsupervised data—or unstructured data—the results can be more insightful and valuable (Batrinca and Treleaven, 2014).

Access to this data is gained through tools provided by either the social networking site or from a commercial service—this is either freely accessible data or

requires a fee. Most commercial services will provide this access via online tools in order to control the access to raw data and to monetize the data as well. One example of a free source, is provided by Google with a tool called Google Trends. This tool is based on how often a particular search is entered relative to the total search volume across regions of the world, to include various languages (Batrinca and Treleaven, 2014). The graph provides a simple display while also allowing for a comparison of up to five topics and the ability to narrow it down by country, region, city, and language. In figure 1, an example is provided for a search item of “B-2”. As seen on the upper portion of this example are the spikes of interest over time. The largest interest being in March of 2013 when two B-2s flew from the United States and overflew Osan Air Base prior to returning to home. A more recent spike in interest is seen in January of 2017 when two B-2s flew from Whiteman AFB and struck ISIS targets in the Libyan coastal city of Sirte. The lower half of the example provides a visual depiction of interest by region. The regional interest is based on the overall time frame available in the interest over time display.

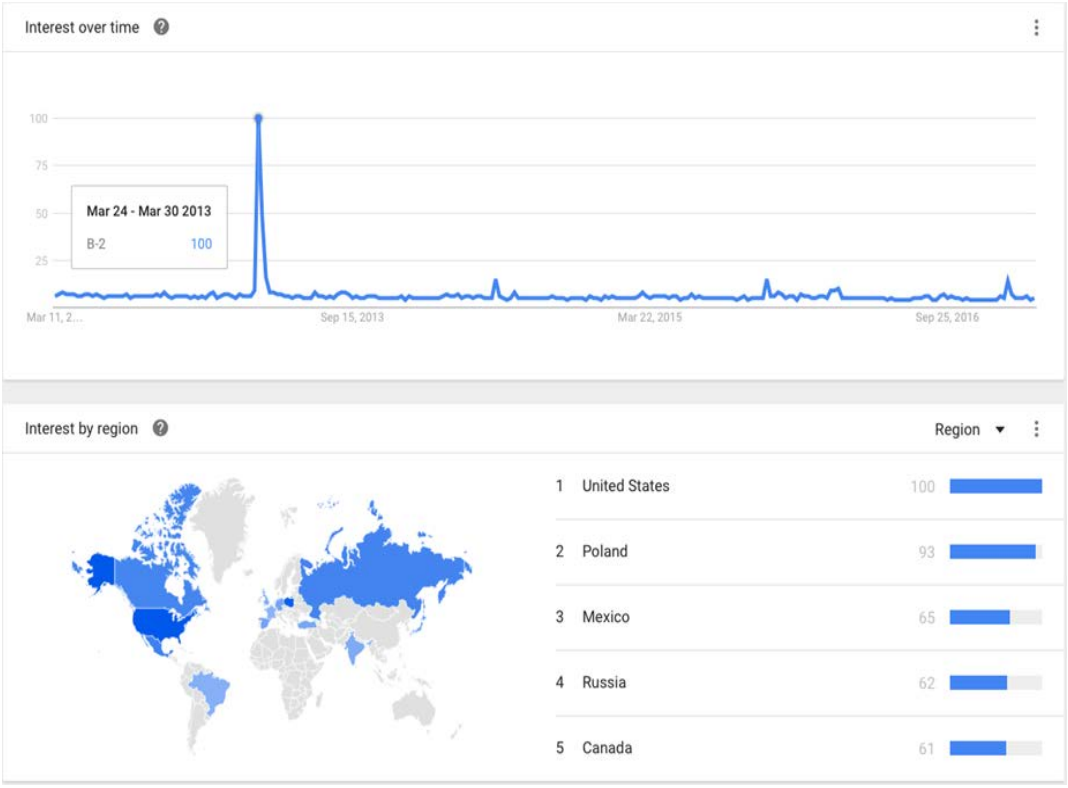

Figure 1 – Google Trends searched item "B-2"

Source: http:www.google.com/trends/explore (2017).

From a commercial perspective companies such as Twitter are making it more difficult for users to gain access to their data by licensing data to commercial data resellers such as Gnip. This is another simple analytical tool providing more than 40 countries with social media data along with Gnip's customers providing more than 95% of Fortune 500 companies with data. The obvious drawback here is the monetary investment required to access this data. When comparing Gnip to another reputable company such as DataSift, one can deduce there are several advantages and disadvantages when choosing either company (see Table 1). As an example, DataSift

offers a more flexible means with filtering unstructured data and thus can provide and store cleaner data compared to the capabilities available within Gnip. The disadvantage in this situation is DataSift appears to be more costly as a result of their abilities. A subscription to Gnip starts out at approximately $500 a month for a baseline ability. This does not include the extra options available such as enrichment add-ons (i.e. language detection, data gathered based on location) or their Data Collector offering a turnkey application (Wagner, 2014). For a more accurate assessment concerning annual cost of operating either Gnip or DataSift within an organization, a discussion with these companies must take place to tailor their product to the requirements of the organization. The annual budget of a company is going to depend upon what level of aggregation it desires, how many APIs or enrichment add-ons they desire, real-time or historical data, and licensing fees. The first step is to contact a sales representative from each company to help customize the best options for the organizational desires. In addition an organization could take this a step further and purchase a visualization tool from Tableau—at a cost of $10,000/year for 10 users—to add another layer of capability to what Gnip and DataSift offer. Ultimately this will require several thousands of dollars a month to operate one of these programs.

Although there is a cost with these programs, there is utility in knowing how frequently a certain search item is entered. There are also more robust tools available to not only capture data, but also to understand and present the data properly. This is done by using comprehensive social media platforms—combining social media archives, data feeds, data mining, and analysis tools—to provide a real-time broad picture of what is occurring around the event or topic in question. There are two main categories these

platforms are divided into. The first focuses on news platforms, such as Thomson Reuters, providing news articles and analytics while targeting the sentiment seen in the news. The other platform deals solely with social network media providing data mining and analytics on companies such as Twitter and Facebook. This platform is mainly used for tracking the sentiment around a company's brand or product. The machine-readable capability within Thomson Reuters draws on data from 1987 to the present and news from over 50 third-parties offering a full text and comprehensive metadata product. Looking at social network media platforms, such as Salesforce Marketing Cloud, Attensity, and Brandwatch, they are able to provide a product that will cover the demographics, influential topics, and sentiments. They also provide analytics and sentiment analysis looking at online consumer conversations and user-friendly interfaces for narrowing down the search, dashboard, and reports generated (Batrinca and Treleaven, 2014). Once a company or organization has decided upon and utilized the aforementioned APIs and platforms to both capture and understand the data in question, the results need to be summarized, evaluated, and presented in an easy to understand format (Fan and Gordon, 2014).

Data visualization tools are the next step in this evolution to allow different users to obtain insight into the massive amount of data they have received thus far. These tools help to narrow down patterns and trends on large scale data sets, which was previously impossible or extremely time consuming. There was initial interest in this area by the U.S. Defense Department, based on a need to explore and synthesis data that is voluminous and spread among different sources. Visualization on big data can be done with frameworks such as Tableau and SAS Visual Analytics—two notable

visualization tools (Fan and Gordon, 2014). With SAS Visual Analytics it offers the ability to automatically highlight key relationships, clusters, and trends leading the interested party to critical insight (See Figure 2). Also an organization is able to apply sentiment analysis—from various sources, such as Facebook and Twitter—to determine a response to the event or topic at hand. Finally, it provides a visualization technique and guided analysis through its auto-charting capability. This would choose the best graph suited for the task (SAS Institute, 2017). When there is a large amount of data to sift through, having the ability to combine both the machine capability and human capability will strengthen the overall ability to make critical decisions while also being able to justify them. This is crucial because it is this final step we are truly getting at when attempting to ensure the human ability to perceive patterns and draw conclusions as a key factor when incorporating data visualization tools. Ideally the end user can rapidly grasp the data within the social landscape without having to understand all of the underlying subtleties of the system.

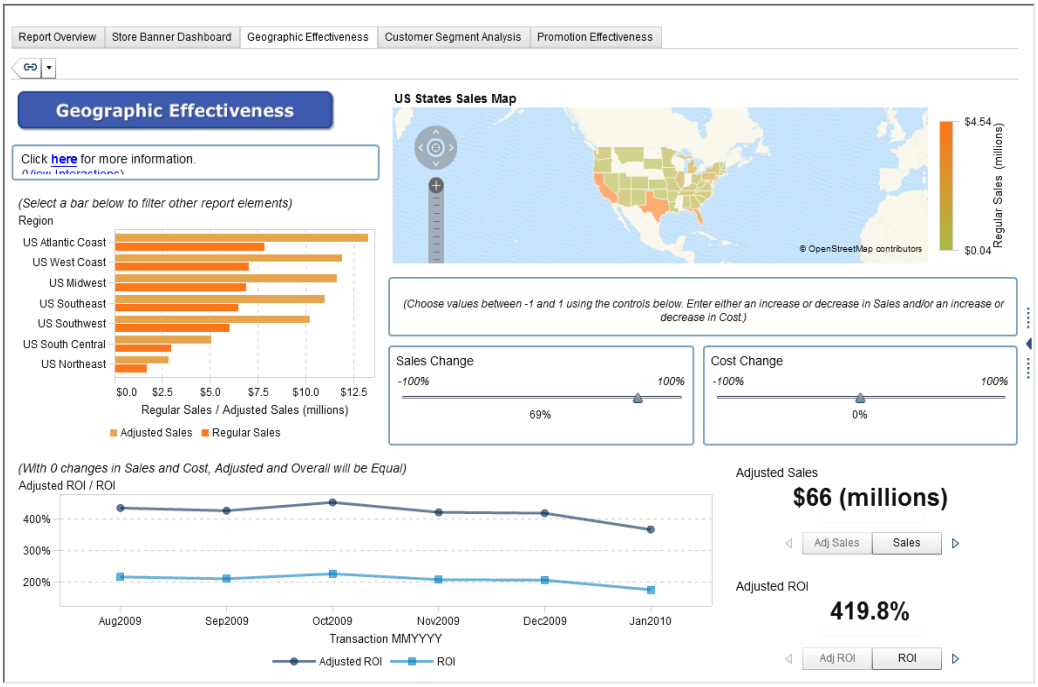

Figure 2 – SAS Visual Analytics Sample Report

Source: http://www.sas.com/en_us/software/business-intelligence/visual-analytics/demo/retailinsights/samppleinsights/sample-report.html (2017).

Challenges with Analysis.

Data analytics provides a means to systematically capture, understand and present social media information while extracting valuable information without having to read all data in its entirety. With the use of these analytical tools important sentiments can be identified and areas can be adjusted or investigated further if desired. However, there are some unique considerations when dealing with social media analysis such as misspelled words and abbreviations. Additionally, there are certain symbols embedded within text, which have meaning and therefore requires extra attention when cleansing the data to ensure a true representation is captured (Mosley, 2017). This goes hand in hand with the inherent issue of unfiltered data being captured

during the initial phase of analysis. Organizations suffer from gathering unfiltered (unstructured) data and if the proper filters are not setup there is the possibility of capturing inaccurate data, which may result in reporting false information impacting the organization or the desired outcome of the organization in a negative manner (Mosley, 2012). With most of the social media data generated by human interaction there will always be the threat of gathering unstructured data. Algorithms must be utilized in order to transform the unstructured data into structured data to properly gain the insight required. To help overcome this it is recommended to have multiple users expressing the same sentiment or reaction in general to trigger a notification. It would be wise to do this not only for multiple users within one social network site, but to verify the sentiment over several mediums (e.g., social networking media, blogs, and news feeds). In addition the credibility of the sentiment could also be strengthened by coupling this approach with data from telecoms, geospatial, and video data (Batrinca and Treleaven, 2014). As mentioned earlier, with the copious amount of data available and the vast number of services providing this data, extracting valuable information will need to be accomplished by incorporating multiple data sources.

Another challenge within analytics is the ever constant presence of big data throughout the data analysis pipeline. Much of the data collected is most likely not relevant to the topic of interest; however, there are filters available to help compress the data to something more relevant and manageable. These filters can be offered either by the company supporting the software or developed by the user in some cases. One challenge is to define these filters to ensure they are not suppressing the data and that they are only filtering out the unwanted data (Labrinidis and Jagadish, 2012). For

example, when considering news feeds does a user setup the filters to focus just on a portion surrounding the topic or does the filter cover the entire news feed? To further compound this challenge, a user cannot assume that all the information received via big data is valid and correct. Big data is not always going to be telling the true story and the user will have to deal with erroneous data at all times.

Data analysis is difficult and to effectively understand a large-scale analysis it must be done in a completely automated manner. It requires data to be formed into a format understandable by a computer and then automatically resolved and in some cases presented as well. There are several powerful commercial platforms, such as the one produced by SAS, mentioned earlier, but accessing those capabilities requires money. This is mainly due to a lack of comparable computational facilities to aid researchers and the academic community (Batrinca and Treleaven, 2014). Most of these facilities are owned by companies such as SAS and Thomson Reuters, which makes them expensive. Although these avenues may be expensive, larger companies are willing to provide the funding to ensure they gain an advantage over their competitor or to at least maintain the status quo with others. The final factor discussed here concerning challenges is the expertise of the staff running the analytical tools. Although these tools provide visualization products, there does require a skill set to handle the ever changing analytical tools, data science, and privacy laws (Pearson and Wegener, 2013). This is in addition to ensuring the proper information is being pursued to measure the performance or effectiveness of the organization. This is an area where technical savvy is required and simply throwing more capability at the problem most likely will not solve the issue.

Organizational Effectiveness

Organizational effectiveness is a broad term that also captures organizational performance while looking at many internal performance outcomes usually associated with more effective and efficient operations. It also looks at other external measures relating to considerations that are broader than those simply associated with some economic valuation (Richard et al., 2009). To some it is a matter of looking at topics such as: what to measure rather than how to measure, how to define various factors, and how to link it all together in the end to assess the organization's goals, objectives, and functions. Others suggest it is a matter of ensuring performance measures are aligned with the organization's strategic goals and that a correlation exists between the strategic goals and the organization's process, which will yield outputs that achieve strategic goals (Hackleman et al., 2014). In order to overcome the challenge with determining organizational effectiveness, one needs to look at the definition, the means of measurement, and determinants of effectiveness. In almost every organization performance measures are utilized to help better grasp an understanding of effectiveness by both assessing and measuring it.

There are several ways in which performance measures can take part within an organization. This is accomplished by implementing measures individually or combined to create a more useful tool. These measures can include items such as: performance measures, dashboards, key performance indicators, and holistic frameworks (Matthews, 2015). For instance, within performance measures you have activities such as input measures, process measures or productivity measures, and

output measures. Input measures in this case are generally the easiest to quantify and gather. As an example, in keeping with this research categories such as aircrew, aircraft, maintenance personnel, facilities, weapons, and fuel could be created.

Process or productivity measures are focused on the activities that are turned into a service or activity. This will ultimately reflect the time or cost in order to perform a specific task or activity. The best way to potentially apply this would be by analyzing the cost per flight hour and also factoring in the facilities and support in order to complete a particular BAAD mission. The process should measure the efficiency of what is occurring within the missions and hopefully answer the question, “Are we doing this the right way”. Overall, process measures are generally a way to look at the cost per service or cost per activity.

Output measures can be viewed from a couple different means as it measures the degree at which the services or activities are utilized. This can be seen as looking at the training received by aircrew and maintenance, while also assuming the assurance and deterrence of adversaries and allies is being fulfilled. Tracking the output of items such as training is already well documented, but looking at the assurance and deterrence measurement is much more difficult. Using social media analysis as a measurement is one step toward understanding the impact of the output in regards to assurance and deterrence. Overall, outcomes indicate the effect of exposure to the services and activities on the customer—or in this case on our allies and adversaries (Matthews, 2015).

Another aspect of helping to manage organizational effectiveness is by assembling all of the information gathered by the selected performance measures and presenting it. This can be done via a dashboard, which has become a popular tool in providing crucial information in a way that does not overwhelm the user. Dashboards are simply a display that focuses on a particular goal or objective and presents all of the relevant data by using visualization and cues to help make decisions (Bremser and Wagner, 2013). This could include items within the dashboard such as different colors, dials, graphs, and positioning of information on the screen all of which are decided upon to aid in an easily understood display. Thus, the basic design must improve insight into the topic in question while also tending to the user's needs and characteristics. If the dashboard is not designed properly by including either irrelevant information or too much information, then the user will be misinformed or overwhelmed with information.

There are different ways in approaching a dashboard depending on the user's experience by using either a strategic approach, analytical approach, or operational approach (Bremser and Wagner, 2013). The operational dashboard is recommended in the context of this research with its ability to monitor strategy implementation at the operational level. It can help support critical events—such as the execution and completion of a BAAD mission—with interaction capability and real-time data updates. Microsoft Excel is one means to create a dashboard with a benefit of being cost-effective. The drawback is relying on personnel to have this ability and time to create what is a monumental task. There are programs available to help save time such as Crystal Dashboard Design, which have become popular. Either way the design of the dashboard needs to address the objective at hand, metrics, user input, and dashboard

monitoring once it is implemented.

The graphics within a dashboard need to enhance the ease of use and highlight any changes within the performance metrics selected. Novice users of the dashboard tend to lean on a graphical display compared to a tabular display as does a more experienced user. A dashboard which is not user friendly will not provide full value, thusly it will create frustration among the user.

IV. Results and Analysis

Overview

Taking into consideration the global requirements of the BAAD mission, the need to deter and assure our adversaries and allies, and the benefits of organizational effectiveness, while utilizing the benefits of social media analytics has provided both a proposed framework and method. The following results and analysis takes into account the literature and is attempting to fill a gap by giving a stepping stone to solving a larger problem. This is intended to help provide a measurement concerning the BAAD mission in order to better understand the environment in which it is conducted.

Framework and Method

In order to fortify the previous positions taken this research is proposing a framework to address the stated research questions. With the ever rising popularity of social media there is a vast amount of data possessing a great potential in providing rather useful information to several different organizations within different industries and parts of government. The users within these social media sites are not passive and have the ability to express themselves and provide a true sense of sentiment, which can be captured with the proper implementation of analysis. Several analytical tools have developed over recent years, but little is known concerning the implementation of the correct methodological approach. To assist with this daunting task this research is proposing a framework where the general analysis follows a three step process of: capture, understand, and present—or the CUP framework (See Figure 3). This will aid in systematically identifying and implementing analysis from start to finish.

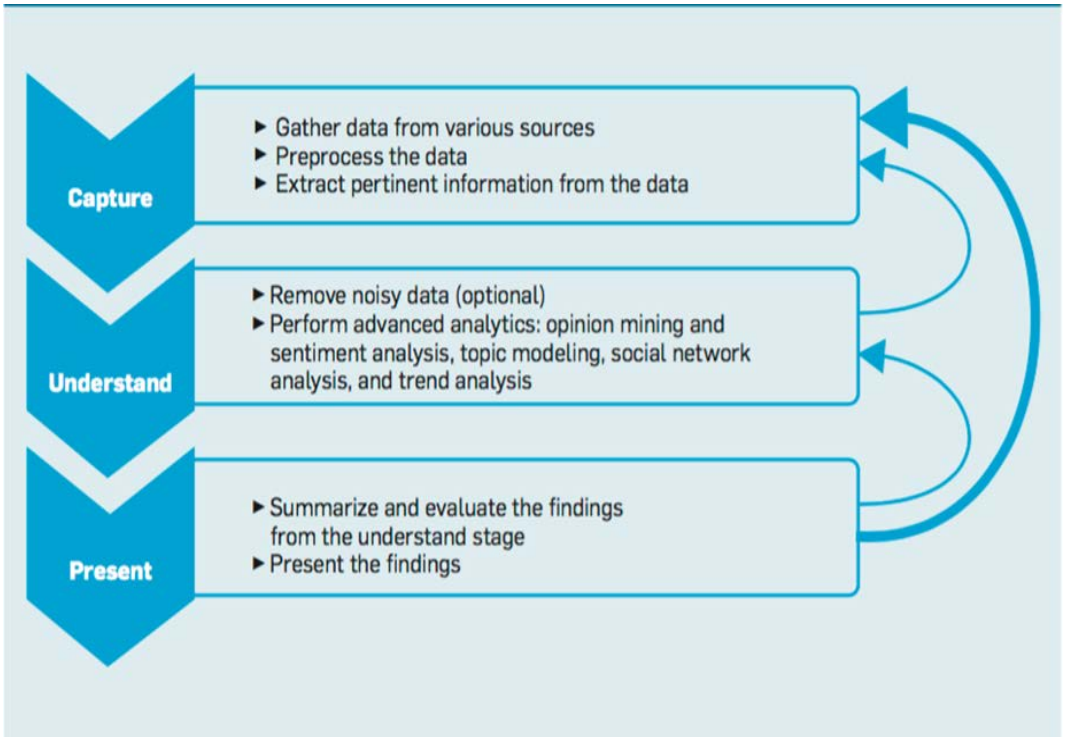

Figure 3 – Capture, Understand, Present (CUP) Framework

Source: (Fan and Gordon, 2014)

The CUP framework is initiated by firstly obtaining *relevant* data. This is accomplished by monitoring several social media sites to ensure a true representation and a holistic view is being captured from the raw data. For instance, this research does not suggest gathering data from Twitter and Youtube, while ignoring Facebook for relevant data. The capture phase is reliant upon an enormous amount of data being collected from several sources such as: news feeds, Facebook, Google, Twitter, and Youtube. Due to the large amount of data gathered in this phase this must be accomplished through an automated means in order to truly be effective. It is much more efficient and effective to invest in and tailor programs such as Gnip to allow the program to sift through the data

and extract the determined and relevant information. Gnip, being the world's largest provider of social data, can provide a way to expand and enhance the data being gathered (Batrinca and Treleaven, 2014). There must be a balance applied to which sources of information is to be focused on and data gathered from. As mentioned before, it is recommended to include the most utilized sites such as Facebook, Twitter, Youtube, and news feeds at a minimum. To help move this data forward and prepare it for the understand phase of the framework it is important to filter the data appropriately. This is done with the help of natural language processing and part of speech algorithms drawing out the sentiment within the data.

Upon capturing the relevant data concerning the event of interest, the organization must then access the meaning of the data and apply a method to ensure proper decision making is conducted. Although the capture phase attempts to narrow down the data to relevant information, it does not filter out all of the unstructured data making the data "noisy". It is therefore required to apply programs such as natural language processing and part of speech tagging. Unstructured data is essentially unprocessed data which is lacking a pre-defined structure and is unanalyzed. This data contains potential value adding information which is only generated by cleaning the data (removing disparities, misspellings, slang), tagging, and then augmenting with other data (Batrinca and Treleaven, 2014). Tagging information with the use of algorithms is beneficial by removing the ambiguity and irregularity within the unstructured data. In regard to the BAAD mission possible keywords or phrases to tag would be: *bomber*, B-52, B-2, B-1, *bomber mission*, and *bomber deployment*. Keywords and phrases such as these would help to refine the search and bring about cleaner data in the end. Combining cleaned data

from several different sources can provide more valuable insights allowing those utilizing the data to answer key questions more easily. Again there will be a sizable portion of data that contains noise that must be removed prior to a proper analysis being conducted (Fan and Gordon, 2014). The *understand* phase is a means to provide information about the sentiment of users. Useful metrics and trends are then able to be drawn from this information and decisions on their concerns, interests, and networks can be deduced. The understand phase is the most crucial phase of the process compared to the *capture* and *present* phases. The results and metrics generated in this phase will have either a positive or negative result when presenting the data in the end, possibly resulting in a poorly made decision.

Being able to actually wring out the meaning behind the data is extremely difficult. Perhaps focusing in on an activity metric concerning the activity surrounding the event in question and an engagement metric looking at user responses within the different social media sites can be useful. This can be done when media users conduct activities such as sharing a post, watching a video, or retweeting a comment. The recommendation for the activity metric is to utilize the CUP framework not only after the BAAD mission has executed, but to use the framework prior to the mission being executed and also during the mission. This would provide a measure to compare the sentiment among users before, during and after execution. Thusly, this can provide a look into the reaction from three different snapshots in time over the duration of the mission. This timeframe could be drawn from a single sortie executed as a BAAD mission or it could be drawn from a BAAD deployment over several weeks. Either way, a method in this case is applied three separate times compared to just once at the end of a mission.

Additionally, the involvement of public affairs from the United States Strategic Command (STRATCOM) could also play a role in this method. Due to the sensitivity of these missions, announcements in the past were provided after the BAAD mission was initiated. A further recommendation is to release a statement prior to execution with a general statement stating a BAAD mission is forthcoming, but not provide any details of the sortie or location keeping the statement unclassified. Unless the classification level of these missions is changed, this seems to be the best compromise at this time. With this type of media coverage it could provide a change in the sentiment of the users within social media and how they react to these missions.

The engagement metric mainly stems from the understand phase of the framework approach. It is looking at how users are actually responding to an event like a BAAD mission. For instance, it can take into consideration not only how many users visited a Facebook page, but it takes it a step further by measuring such items as: sharing a post, clicking an embedded link, watching a video, and retweeting within Twitter (King, 2015). As discussed prior, this must be done not only with popular social media sites, but several sources must be taken into account to get a true representation. Both the capture and understand phase will be important here to ensure the proper filters are created and the appropriate social media sites and news feeds are being monitored. Once all of the data from these metrics and analytics is gathered it needs to be summarized, evaluated, and shown in the proper fashion. This is where the present phase comes into play.

Results of analysis must be presented in a way the user is able to easily understand the information given to them. Visualization techniques are used to provide

information, such as the dashboard, which can aggregate information from various sources of information (Stieglitz and Dang-Xuan, 2012). It is important to assume the ability of the user at this point in the process is one with little experience and a low skill level when analyzing this type of data. Therefore, it is crucial to ensure the presentation or dashboard is tailored to be easily understood. By using the aforementioned SAS Visual Analytics within the literature review, users can easily identify patterns, trends, and relationships in the data. Tools such as this can automatically classify and rate opinions while pulling data from web sites and social media and then process the information in a unified format to help evaluate the relevance with regard to the pre-defined topics. The user in this case is provided an easily understood dashboard while not having to manually gather and evaluate the data, saving a vast amount of time.

To further aid in the use of the CUP framework users are able to provide feedback and adjustments if necessary once all three phases of the framework are completed by returning to a previous phase. This can either be done after the *understand* phase or the *present* phase providing the necessary recommendations to make the *capture* or *understand* phase more effective. These phases are neither independent nor linear, but rather they can be viewed as overlapping and can be improved upon as the process is conducted. For example, if patterns are not revealed in the *present* phase, perhaps changes can be made to either or both the *capture* and *understand* phase to fine tune the parameters within the analysis. This is not only a benefit of this approach, but recommended to ensure the most effective decisions are being made based on the data.

One short example which attempts to bring all aspects of this research together is applying it to a political campaign. There is a need during a political campaign to access

the large amount of data on social media to ensure campaign effectiveness while monitoring political topics and issues. A difficult part of communication is disseminating information across a large community. In this case a political campaign can use the CUP framework and sentiment analysis to gain insight into the ideas and opinions of the community helping to gauge public opinion. Assuming this campaign were to use a program such as DataSift coupled with the Tableau visualization tool it would be able to narrow its analysis down to the area in which the campaign matters.

DataSift with Tableau software gives the user a capability to work with keywords or phrases through filters while displaying real-time data from several different sources within 200 milliseconds. Furthermore, the user can stack filters for a more advanced search to see what source the information is coming from while also setting a geographic boundary of where this information is drawn from. This can allow for a more directed effort on say Facebook compared to Twitter if the campaign team were to see most discussion occurring on Facebook. Finally, that data is fed directly into the Tableau visualization tool to display a visual picture of the sentiment being expressed within the defined filters. Tableau can provide several different visuals for the user to ensure the best means to communicate the public opinion is available to the user. The dashboard information provided is highly customizable and offers historical as well as real-time data all set by the user if so desired. With nearly 3 billion posts everyday this process is able to bring the conversations and opinions back into the campaign for assessment on the campaign's effectiveness. This is all done using the capture, understand, and present framework allowing for feedback throughout the phases to adjust filters or keywords based on the results of both the understand and present phase. Leveraging social media

from a political campaign's aspect improves the communication with citizens and voters. It could also help to maintain the reputation of the campaign within visual communities on a real-time basis. From this approach a political campaign can gain a more transparent understanding of what the voters are thinking, while having the ability to re-address their campaign efforts based on the information gathered from social media analytics.

Summary

The information provided in this chapter has proposed a means to utilize a framework and apply methods based on the massive amount of data which is available via social media analytics. With such a vast amount of data to be collected and analyzed there needs to be a means in which an organization can focus on and apply, while trying to gain a metric. In this case the CUP framework, activity metric, and an engagement metric are proposed to help answer the research questions.

V. Conclusion and Recommendations

Summary of Research

The intent of this research was to simply propose a contribution in the form of a framework and method to aid in measuring the effectiveness of the bomber assurance and deterrence mission. This was done with the CUP framework and by using aspects of social media analytics to address the research questions concerning this research. The perceptions of other people are always an important piece of information to consider when making decisions (Pang and Lee, 2008). This holds true not only within deterrence and assurance, but it also applies within social media analytics when attempting to gain the sentiment of users. With the use of these tools organizations are able to obtain the opinions and feelings of a large amount of people utilizing social media. The implications of this ability has great potential to identify patterns and themes while comparing the results to organizational goals. Based on an extensive literature review it is obvious the relevance and need for analyzing social media is growing. Although this research has provided a means to measure effectiveness, there are other areas of research which can build upon these recommendations to further the effectiveness of this capability.

Implications

This paper began with the requirement of the BAAD mission and its importance to sustaining assurance and deterrence to our allies and adversaries. In order to achieve this goal organizations within the Air Force and the United States Strategic Command need an ability to help measure the effectiveness of these missions. Based on the data

presented in the literature review one needs to have the ability to identify patterns and combinations of words which indicate sentiments within social media analytics. Within social media analytics the ability to measure the interest in opinions and sentiment is proposed by using sentiment analysis. This has the ability to cover different domains from gathering opinions within politics to government regulation proposals. It is the belief of this research that another domain to be applied is within measuring the effectiveness of BAAD missions. Within this capability those measuring the effectiveness of these missions can take advantage of the automated data collection available. This allows very little interaction resulting in a time savings and also filtering out "noisy" data, which helps with gathering relevant and more structured data. Additionally, this needs to be accomplished across several different sources to increase the value of data being captured. By only focusing on one data source or not including one of the top utilized social media sites such as Facebook, there is a real chance the data captured, analyzed and eventually presented will not contain as much depth and meaning as if several sources are considered including the most popular sites. Businesses have realized this approach to measuring their effectiveness and although it is for a monetary reason, this paper is presenting these capabilities in order to leverage the power of social media to help succeed in this dynamic world.

In order to enact this ability the recommendation is to consider the use of programs such as Gnip, SAS Visual Analytics, and Thomson Reuters. These would provide a user within organizations such as the United States Strategic Command to quickly and with ease capture, understand, and present data from a social media and news feed perspective. The results can then be included within the after action report,

which is generated after the BAAD mission. This will provide another well-developed layer within the final analysis of determining if these sorties are effective in the manner in which they are planned and executed.

Outlining this whole process is the help of a framework that provides a step by step process while also allowing feedback throughout. The CUP framework is recommended to allow guidance to the technique of applying social media analytics to the BAAD mission. From a practical perspective a framework serves as a guideline for the development of collecting, monitoring, analyzing, and summarizing relevant content. The implication here is applied to the communication links of say STRATCOM (i.e. strategic messaging and public affairs campaigning) against our allies and adversaries (i.e. feedback, opinion, sentiments). A framework should provide the user with a way to investigate and better understand the complex relationships between the execution of a BAAD mission and the effect it has on both our adversaries and allies. With the use of this framework coupled with social media analytics provides a means to get closer to answering the question of how effective is the BAAD mission.

Appendix A – Pros and Cons of Applications

	Pro	**Con**
Gnip	Search API for Twitter (fire hose data including real-time and historical data)	Fewer enrichment add-ons available
	More fire hose data	No capability offering automatic categorization of data
	Powerful filtering through Power Track	
	Enrichment add-ons (i.e. language detection, Profile Geo)	
	Data Collector turnkey application	
DataSift	Stores cleaner data	No search API for Twitter (obtains data from Gnip)
	More flexible data filtering capability	More expensive
	Enrichment add-ons (i.e. sentiment analysis, language detection)	Fewer real-times streams of social data
	Seamlessly integrates data with Tableau	
	PYLON application specific for Facebook	

Appendix B – Application Pricing Comparison

	Gnip	DataSift
Subscription	Starts at ~$500/month	Starts at ~$3000/month
Licensing Fees	Separate Fee	Separate Fee
Enrichment Data	Separate Fee	Separate Fee
Processing (DPU)	None	On Demand and Subscription Payment Plans
Tableau Visualization Tool (additional cost):		
Subscription	Starts at $10,000/10 users annually	Starts at $10,000/10 users annually

Measuring Effectiveness of the Bomber Assurance and Deterrence Mission

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Air Force Institute of Technology

Abstract

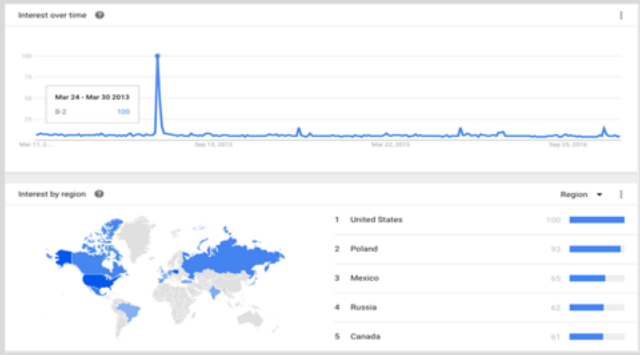
This research paper looks at the global requirement of the Bomber Assurance and Deterrence (BAAD) mission and proposes both a framework and a metric to aid in measuring the effectiveness of this mission. It takes into account the potential of utilizing social media analytics and applying it to the BAAD mission. Given the rapid growth of social media, people are able to—more than ever before—express themselves concerning their views, opinions, and emotions on several different forums, blogs, and social networking sites. With the amount of social network sites (SNS) available, it provides a great medium for individuals to communicate with one another while also providing a means to capture sentiment, effectiveness, and how an organization is affecting people around the world.

Research Questions

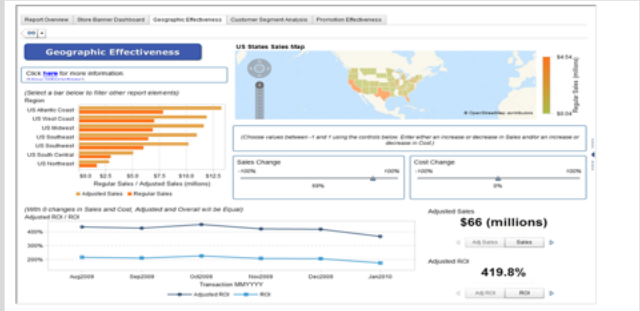
Research Question: What is an efficient means to measure the effectiveness of the bomber assurance and deterrence mission?

Investigative Question 1: What is an effective approach at implementing social media analytics?

Investigative Question 2: Can we determine how effective the BAAD mission is from social media sites, official government statements, news outlets, etc.?



Google Trends searched item "B-2"



SAS Visual Analytics Sample Report

Analysis and Results

The analysis and results of this research has proposed a means to utilize a framework and apply some metrics based on the massive amount of data which is available via social media analytics. With such a vast amount of data to be collected and analyzed there needs to be a means in which an organization can focus on and apply, while trying to gain a metric. In this case the CUP framework, activity metric, and an engagement metric are proposed to help answer the research questions.

Implications

This paper began with the requirement of the BAAD mission and its importance to sustaining the assurance and deterrence to our allies and adversaries. In order to achieve this goal organizations within the Air Force and the United States Strategic Command need an ability to help measure the effectiveness of these missions. Based on the data presented an effective means to achieve this goal is with the ability to identify patterns and combinations of words indicating sentiment within social media analytics. The ability to measure opinions and sentiment is proposed using sentiment analysis.

Conclusions & Recommendations

The intent of this research was to simply propose a contribution in the form of a framework and metric to aid in measuring the effectiveness of the bomber assurance and deterrence mission. This was done with the CUP framework and by using aspects of social media analytics to address the research questions concerning this research. With the use of these tools organizations are able to obtain the opinions and feelings of a large amount of people utilizing social media.

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